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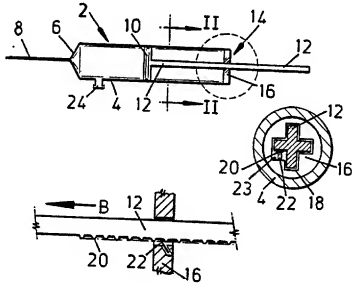

(57) Abstract

The invention relates to a disposable syringe adapted for a single use only. The syringe (2) comprises a hollow body portion (4) provided at a first end (6) with a closure adapted to incorporate a protruding hollow needle (8), and a piston member (10) slidably located within the hollow body portion (4), the piston member (10) being provided with an actuating rod (12) emerging from a second end (14) of the hollow body portion. Engagement means (22) are provided at the second end of the body portion (4) for selectively interengaging with serrations (20) on the rod (12) to effect a clamping action thereon so that the piston member (10) is permitted to partake of a single discharging stroke action but is prevented from partaking of a return stroke, so precluding a second discharging stroke action taking place in said first mentioned direction. Various other features are included in the con-

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DISPOSABLE SYRINGE

The present invention relates to syringes.

Syringes conventionally fall into two main categories. In one category the syringes are intended to be re-used and are made of metal and glass which permits sterilization of the syringe between uses. The other category of syringe is intended to be for a single use only and is usually referred to as disposable. In this second category the syringes are primarily made of inexpensive plastics material. In both categories the syringes incorporate a hollow needle which is made of metal.

It is desirable that disposable syringes be rendered ineffective after a single use so that they cannot be thereafter re-used. Such an arrangement is not at present possible with disposable syringes and it has been known for unscrupulous persons to acquire used disposable syringes and to effect second and subsequent additional uses of these syringes. This gives rise to a substantial risk of cross-contamination between users in that the disposable syringes are not usually sterilized between uses.

It is an object of the present invention to provide a new and improved form of disposable syringe.

The present invention provides, in one of its several aspects, a disposable syringe comprising a hollow body

portion provided at a first end with a closure adapted to incorporate a protruding hollow needle, and a piston member slidably located within said hollow body portion, the piston member being provided with an actuating rod member emerging from a second end of the hollow body portion, and wherein means is provided at said second end for selectively interengaging with said rod member to effect a clamping action thereon, the construction and arrangement being such that the piston member is permitted to partake of a single discharging stroke action in a direction towards said body portion first end and prevented from partaking of a return stroke so precluding a second discharging stroke action taking place in said first mentioned direction.

Thus, in an example of a device according to the invention the selective interengagement means is arranged to permit the rod member to slide in one or more selected pre-determined directions with respect to a hollow syringe body. Advantageously, further movement may take place in a rotary direction, and, if necessary, reverse rotary direction may be prevented by provision of further selectively interengaging means. All such selectively interengaging means according to the invention may be arranged so that during a first movement of the rod in one selected direction the interengaging means is inoperative but in an attempted second movement of the rod member in the opposite direction to said one direction the means is

rendered operative and is arranged to inhibit subsequent movement of the rod in said one direction.

The interengaging means may incorporate a tongue or tongues secured to a portion of the hollow syringe body and engaging with a roughened or grained surface configured to permit relative movement in one direction only. The surface may comprise a series of teeth or like formations upon the actuating member. The tongue or tongues may project in an oblique direction relative to the longitudinal axis of the syringe, the sense of the direction being appropriate to the desired direction of movement. It is preferred, but not essential, that the teeth should be located in an at least slightly recessed portion of the actuating member and for this reason the actuating member may be cruciform in cross-section, or may preferably be of rectangular or square cross-section with recessed side surfaces.

Conveniently a longitudinally extending series of teeth on the actuating member may extend therealong for the greater part of its length, except for at least one portion thereof, being the end portion adjacent the needle.

The present invention further provides, in another of its several aspects, a disposable syringe as described in the fifth paragraph of the present specification, wherein said actuation rod member is at least partially hollow so that a tampering action upon the rod to avoid the clamping action of said selective interengagement results in the

formation of a leakage path from the hollow body portion of the syringe through the rod to waste.

Preferably, the rod is of a non-circular cross-section and one of the examples to be described below illustrates a cruciform section.

Conveniently, said second end of the hollow body portion is provided with a disc-like end wall having an aperture therein complementing the configuration of the cross-section of the rod which passes therethrough. Conveniently said interengagement means may be mounted in a side surface of said aperture and adapted to engage a roughened or grained surface on said rod, or with a series of teeth or like formations provided to permit relative movement in one direction only.

Advantageously, the piston member may be provided upon its rod side with an irregular surface so as to prevent replacement of the rod by a substitute rod having a smooth surface in place of said roughened or grained surface, said irregular surface being for example, knurled, to minimise contact points for a bonding agent such as so-called "super glue" and therefore to causing a weak or ineffective bond to be formed.

The invention still further provides, in another of its several aspects, a disposable syringe as described in the fifth paragraph of the present specification, wherein in order to cause a tampering action upon the selective interengaging means to result in the formation of a

leakage path from the hollow body portion to waste, the hollow body portion is provided with a double wall construction comprising a first, inner, wall in the form of a cylindrical sleeve open at an end thereof adjacent said first end of the hollow body portion and within which sleeve is received said piston member in a liquid-tight fit, and an outer, concentrically arranged wall having a first diameter at said first end and a second, larger, diameter at said second end of the hollow body portion there being provided a clearance between the open end of the sleeve and the outer wall at its first diameter to effect a leakage path to waste in the event of rupture of the outer wall.

The present invention further provides, in another of its several aspects, a disposable syringe as described in the fifth paragraph of the present specification wherein said hollow body portion comprises a tubular member a first end of which is in contact with said closure in a sealing engagement therewith, a second end of said tubular member being provided with a second closure adapted partially to close said second end so as to allow passage of the piston actuation member therethrough, and wherein the closures at said first and at said second ends are linked by wall means positioned externally of said tubular member, the construction and arrangement being such that access to the tongue means to release said clamping action is restricted by said wall means and second closure,

removal of said closure or severance of the link provided by said wall means resulting in the release of the sealing contact between the first end of the tubular member and the first closure.

Conveniently, the piston member provides a sealing means against the inside of the hollow tubular member and is mounted upon the first end portion of the actuating member, said actuating member being hollow.

Advantageously, in order to cause a tampering action upon the selective engagement means to result in irreparable damage to the device, there is provided so as to pass through said first closure a needle having both ends adapted to carry out a piercing action, a second, inwardly directed, end of the needle being provided with a piercing end adapted to render ineffective for future use the sealing means which normally enables the syringe to be charged with liquid. Conveniently the second needle end may be arranged to pierce the end face of the piston member or of its supporting actuating member.

There will now be described several examples of disposable syringes according to the invention. It will be understood that the description which is to be read with reference to the drawings, is given by way of example only and not by way of limitation.

In the drawings:

Fig. 1 is a diagrammatic sectional view of a first example of a syringe according to the invention;

Fig. 2 is a cross-section on line II-II of Fig. 1;

Fig. 3 is an enlarged, fragmentary view of a portion of Fig. 1;

Fig. 4 is a similar view to that of Fig. 3 of a second example of a syringe according to the invention;

Fig. 5 is a view, partly in section, of a third example;

Fig. 6 is a view on arrow A of fig. 5, with a piston member rod omitted;

Fig. 7 is a perspective view of a first end of an inner wall of the third example;

Fig. 8 is a fragmentary, perspective view of the piston element and rod of the third example; and

Fig. 9 is a view similar to Fig. 5 of a fourth example;

Fig. 10 is a side view of a fifth example of a syringe according to the invention;

Fig. 11 is a longitudinal sectional view of the first end portion of the syringe of Fig. 10;

Fig. 12 is a longitudinal sectional view of the second end portion of the syringe, taken on an axial plane rotated through 45° compared with Figure 11;

Fig. 13 is a cross-sectional view on line XIII-XIII of Figure 12;

Fig. 14 is an exploded perspective view of a portion of the second end of the syringe shown in Figure 12;

Fig. 15 is a perspective view of the first closure, a needle and wall means of the fifth example of a syringe;

Fig. 16 is a perspective view of piston actuating means of the syringe;

Fig. 17 is a view of the end face of the actuating means of Figure 16 in the direction of arrow E;

Fig. 18 is a perspective view of a tubular member of the syringe; and

Figs. 19 to 23 show a sequence of steps in the assembly of the syringe.

As is illustrated in Fig. 1 a disposable syringe 2 comprises a hollow body portion 4 which is made of a synthetic plastics material and which is provided at a first end 6 thereof with a closure incorporating a protruding hollow needle 8. A piston member 10 is slidably located within the hollow body portion 4 and is connected to an actuating rod 12 which emerges from a second, opposite, end 14 of the hollow body portion 4 to enable the piston member 10 to be slidably moved along the length of the hollow body portion 4. In accordance with the present invention, the syringe 2 is provided with means located at the end 14 of body portion 4 for selectively interengaging with the rod 12 to effect a clamping action thereon as will be explained.

Fig. 2 illustrates the selectively interengaging means comprising a closure disc 16 which is secured in a liquid-tight manner at its outer peripheral edge to the hollow body portion 4. The disc 16 has a central aperture 18 through which the rod 12 protrudes. The rod 12 which is

cruciform in cross-section is provided with a series of tooth-like formations 20 and the disc 16 which is made of plastics material carries a tongue-like element 22 which is seated in a recess 23 formed in disc 16. The element 22 projects towards engagement with the teeth 20 of rod 12 and is inclined at an oblique angle with respect to the longitudinal axis of the rod 12. As illustrated, the element 22 is disposed at an oblique angle of about 20° and accordingly the rod 12 when moved in the direction of the arrow B in Fig. 2 is free to move past the element 22 and therefore to push the piston member 10 in the direction of the needle 8. However reverse motion of rod 14 is prevented by the element 22 engaging with and effecting a clamping action on the teeth 20 of rod 12. It will therefore be seen that in Fig. 2 the piston member 10 is free to move in only one direction, that is, towards needle 8 in order to expel fluid contained within hollow body portion 4. In this arrangement, the hollow body portion 4 is provided with a capped aperture 24 to enable the hollow body portion 4 to be charged with fluid in the first instance.

Conveniently, the teeth 20 in this example are of the multi-pimpled type conventionally utilized in tie-wrap devices or cable ties. The element 22 is advantageously of spring steel.

In a second example of a syringe according to the invention as illustrated in Fig. 4 is generally similar to

that shown in Figs. 1 to 3, except that the element 22 is reinforced with a support member 26 to ensure that however much force is used to attempt to move the rod 12 in the direction of arrow C in Fig. 4, the element 22 will resist reverse movement and is unlikely to break. Continued movement of rod 12 in the direction D is permitted.

It has been found advantageous to provide the element 22 with a knife or chisel edge, so that if force is used to achieve movement in the "wrong" direction, the element will cut into and damage the toothed portion of the rod.

It will also be observed that the teeth 20' are in the form of serrations having a slant in a given direction. It will be found that the combination of the oblique element 22 with such teeth gives optimum engagement. In circumstances when the hollow body portion 4 is not to be filled by means of the capped aperture 24, it will be necessary to draw fluid into the portion 4 by means of a withdrawing stroke of the piston rod 12. In order to ensure this movement too is irreversible, a second set of teeth 20" are provided on the opposite face of rod 12 so that on rotating the rod through 180° while a plain end portion thereof (not shown) is received in the aperture 18 of the disc 16, i.e. at the end of its stroke, the teeth 20" engage a further oblique member 22' which is slanted to the orthogonal direction by the same angle but on the opposite hand so that travel in the direction D is prevented but travel in the direction C is possible.

Suitable arrangements, for example a third set of teeth with an engagement tongue element, may be provided to prevent further rotation through 180° to return the syringe to its ready-for-use condition.

Fig. 5 shows a third example of a syringe according to the invention. The syringe 28 comprises a hollow body portion 30 having two walls 32, 34 in the form of co-axial sleeves. Received in a sliding fit within the sleeve 32 is a piston member 36 the movement of which is actuated by a rod 38, which passes through a cruciform aperture 40 in an end closure 42. The rod has a plain end portion 44 and a length 46 having a cruciform cross-section. The rod 38 is hollow as may be seen from Fig. 8, and is provided on opposed faces of one arm of its cruciform section with teeth 48 and 48' corresponding in layout and appearance to teeth 20 and 20' of Fig. 4. The hollow chamber of the rod 38 communicates with a leakage aperture 50 (Fig. 8) in the piston member 36. Although this aperture is shown as circular in cross-section, it may preferably be irregular in shape to avoid ease of plugging in a tampering attempt.

The inner sleeve formed by a perforated wall 32 is cylindrical in form and received the piston 36 in a close fit therewithin. The reason for the perforations 33 which are fine apertures in the wall will be explained below. Enveloping the wall 32 is the outer wall 34 which is slightly frusto-conical in shape, there being an annular space 52 between the walls which is in the region of

0.0001 inch (0.025mm). It will be understood that the space 52 and the degree of conicalness of 34 are exaggerated in the drawing for the sake of clarity.

The upper end of the sleeve 34 as viewed in the Figure is sealed by means of an O-ring 54 to an inturned lip 56 of the wall 34, said lip including an annular recess 58 into which is received a projecting hollow boss 60 of the end closure 42.

The cruciform aperture 40 formed in the boss 60 comprises two opposed grooves 62 as viewed in cross-section, which are plain and relatively narrow compared with two opposed grooves 64 which are wide enough to accommodate the teeth 48, 48' that engage either tongue member 66 or 68 mounted in the side surfaces of the grooves 64. It will be appreciated that the grooves 62 are too narrow to accept the toothed portions of the rod.

The lower portion of the sleeve 32 is open and its edges are spaced from the closed end portion of the hollow body wall 34 in which the needle 70 is mounted. Protuberances 72 are formed on the bottom edge of the sleeve 32 to ensure that the space 72 is always present and cannot be closed in attempts to tamper.

Fig. 5 shows the syringe in a condition in which liquid may have been drawn into the chamber of the hollow body portion 30 by an upward movement of the piston member 36. This upward movement is possible since the teeth 48 are able to pass the tongue 66 which is slanted to allow

this movement but to prevent reverse movement. There will be a negligible amount of liquid present in the annular space 52 but this will not affect the normal action of the syringe.

However, once the syringe is charged with liquid, a discharging downward movement of the piston is required. As mentioned above the layout of the teeth 48 and the tongue 66 prevent this. It is necessary therefore to rotate the piston rod 46 and the piston 36 through 180°. This is made possible by the plain portion 44 of the rod being positioned in the aperture 40 at this stage. The teeth 48′ are therefore then brought in to juxtaposition with the tongue 68 which allows downward movement. Little or no liquid passes through the aperture 50 in the piston 36 because of the presence of air or liquid trapped in the hollow interior of the rod. The teeth 48′ and the tongue 68 will now prevent a reverse, upward, movement such as may be required if an attempt is made to re-fill the syringe. It will be appreciated that the rod cannot be rotated either on or back through 180° to bring it to its original position since the upper portion of the cruciform section of the rod is still received within the correspondingly shaped aperture 40. It will be recalled that, even if they were accessible at this point, the grooves 62 are too small to accept the toothed portions.

There may however be instances in which the particular configuration of the syringe requires a further locking or

clamping mechanism to govern the rotary movement. If required therefore, it is apparent that a toothed portion may be provided around the appropriate portion of the perimeter of the rod to engage with an engagement member projecting towards the rod in a radial plane with respect thereto.

There are however several techniques which may be used by those wishing to by-pass safety measures and re-use a syringe such as above described. One tampering move which may be used might to be attempt to cut off the toothed portions. Because the rod is hollow, such an attempt will certainly breach the rod walls and allow air to escape and so provide a leakage path through the aperture 50 and the rod 46, which will be greater than the passageway through the needle 70.

Another tampering move might be to attempt to remove the tongues 66 and 68. To gain access to these will involve rupturing the wall 34. This will release the air/liquid trapped in the annular space 52 to provide a leakage path through which the contents of the syringe will tend to travel in preference to passing through the hollow needle.

To attempt to dispense with the wall 34 and simply to use the inner wall 32 will not succeed since not only is the wall 32 perforated at 33 but also the needle is secured in the end closure of wall 34 and to attempt to remove the needle and re-mount it in the lower part of the

sleeve wall 32 would not be likely to produce an effective seal. To attempt to use only the wall 34 would also be futile, because of its frusto-conicalness preventing a proper surface match for the piston 36.

The presence of the protuberances 72 may serve the additional purpose of hindering attempts to form a reliable seal between the lower edge of the wall 32 and the outer wall 34 to prevent leakage.

Various other precautions may be taken to minimise the chances of successfully adapting a used syringe according to the invention for illicit re-use.

An attempt could possible be made to snap the rod off at the portion 44 and to insert a plain rod having a portion of adhesive applied to its end surface so as to contact the rear (rod-side) surface of the piston. Where this surface is provided with a series of projections 74 of varying height, it is difficult to obtain more than a point contact with the highest of these projections.

Attempts to remount the needle for re-use may be hindered by the provision of an original mounting which is non-circular or otherwise irregular in cross-section. Of course, the syringe may be provided with a ready-to-use needle or may require the attachment of the needle to the syringe body according to the conventional manner.

Other features of the device may include provision to reduce the normal slight loss of liquid to the annular gap 52 between the walls 32 and 34 by providing projections on

the confronting surface thereof which take up space in the gap. In any event, however, the liquid loss to the gap 52 is at the very maximum 5% of the capacity of the syringe, which may be considered an acceptable penalty in return for the advantages of syringes according to the invention.

Fig. 9 shows a fourth example of a syringe according to the invention which is generally similar to that shown in Figs. 5 to 8, with the exception that the tongue portions 66' and 68' are housed in an outwardly facing boss 76 in alignment with the toothed portions of the rod 46.

The syringe shown in Fig. 10 comprises a hollow body portion composed of a transparent tubular member 82 calibrated to indicate the volume of its contents, and provided with a first closure 84 in which in the present example is fixed a double-ended needle 86.

It will be understood that the closure may be adapted to receive a separate needle if preferred by the user.

The closure 84 which is of a plastics material which is comparatively soft relative to the material of the member 82 so as to provide a sealing action therewith, is provided with wall members 88 which act to link the first closure 4 with a second closure 90 which sealingly closes the rear end of the syringe. In Figures 10-18, the rear end of the syringe and of its parts, is shown at the lower end of the drawings.

A piston 92, comprising in the present example a

double seal rubber or plastics annulus, is mounted upon an actuating device in the form of a hollow rod 94.

An end face 96 of the rod 94 is provided with an off-set recess 98 which, in an uncharged condition of the syringe, receives a rear end 100 of the needle 96, which is also off-set with respect to the axis of the rod. The rod is also provided with a flange 102 to retain the rubber piston 92 in position.

Immediately rearward of the piston 92 is a circular cross-section portion 104 of the rod 94 although the main length of the rod is generally square in cross-section (see Fig. 13). Opposite side surfaces 106 of the square cross-section portion are plain and intervening opposite side surfaces 108 are corrugated or ribbed. Apertures 109 formed in the rod 94 assist in positioning the moulding core during manufacture and also provide a region of weakness intended to fail in the event of any rough tampering action. Flange 110 at the rear end of the rod 94 has a recess 112 for a user's thumb.

When the syringe is used, the user's fingers engage two opposed lugs 114 provided on the closure 90. The closure 90 has an aperture 116 through which passes the rod 94.

The closure 90 which is joined to the wall members 88 by a welded seam 118, is further provided with two pairs of projections 120,122, arranged alternately around the aperture 116. The inwardly facing surface of each

projection 120 is provided with a rearwardly inclined flexible tongue 124 and the inwardly facing surface of each projection 122 is provided with a forwardly inclined flexible tongue 126. It will be observed that one pair of tongues 124 or 126 will be aligned with the plain sides 106 of the rod 94 and the other pair 126 or 124, with the ribbed sides 108. According to the direction of inclination of the tongues, so will the permitted direction of travel of the piston 92 be governed.

In operation, the piston 92 is intended to partake only of two piston strokes. From a fully enclosed condition as shown in Figure 11 and the left hand side of Figure 12, the piston 92 and the rod 94 may be withdrawn to charge the syringe, the tongues 124 sliding over the ribbed sides 108 of the rod. The other tongues 126 readily slide over the plain sides 106.

However, when the rod is fully withdrawn it cannot be pushed back into the syringe because of the direction of inclination of the tongues 124. A rotary movement of the rod 94 through 90° is however permitted at the end of its outward stroke by the absence of ribs at the circular cross-section area 104 which brings the tongues 126 into alignment with the ribbed sides 108 over which the tongues 126 may slide while the tongues 124 may readily slide over the plain sides 106. Thus the liquid-injecting stroke may be completed. However, no circular cross-section area is provided which would permit the rotational movement which

would allow tongues 126 to be disengaged from the ribbed side 106 in an attempted return stroke and the syringe cannot be re-used. Moreover, when the piston and rod have been fully depressed, the rotational movement about 90° has taken the rear end of the needle 86 out of alignment with the recess 98, and the needle thus pierces the hollow rod forward of the sealing surfaces of the piston to break the seal.

Further attempts to recharge the syringe are intended to cause additional irreparable damage to the syringe. To this end, the construction and assembly of the component parts has been arranged to be carried out as follows.

It will be noted that in Figure 12 the wall portions are shown secured to the closure 90 by the welded seam 118. If any attempt to tamper results in the breakage of the weld or the linking action of the walls, then this breaks the sealing action of the softer plastics closure 84 against the tubular member 82, which is difficult to re-establish. The welding step is the final step in the following sequence.

In Figure 19, the rod 94 is shown about to be inserted into a temporary sleeve or sheath 128 which provides a smooth surface for the closure 90 to be slipped over the rod 94 without engagement of the ribbed surface of the rod by the tongues on the closure.

When the closure is in place as in Figure 20, the sleeve may be removed. Figure 21 shows the piston 92

positioned upon the flange 102 and the tubular member 82 ready for placing over the rod 94. The closure 84 with its wall members 88 is the next component to be placed over the members 82 so that the weld 118 may be formed (see Figure 23). In order to ensure the correct positioning of the walls 88 with respect to the closure 90, small protuberances 130 are provided on the end surfaces of the wall members 88 (Figure 14) which are received in recesses 132 in the closure 90, the region of contact, i.e. the sites of the welded seams being indicated at 134 in Figure 14.

When the weld is complete, the syringe is ready to be filled. A safety cap 136 is placed over the needle 86 and the syringe may then be packaged for distribution as desired.

Various modifications may be made within the scope of the invention as defined in the following claims. For example, it is frequently the case where the contents of the syringe are self-administered and the user makes adjustments to the needle position partway through the injection stroke to maintain communication with the relevant vein. Thus there may be provided a gap in the ribbed surface 106 of the fifth example to enable the piston to be moved back and forth within close limits to accommodate this requirement.

CLAIMS:

1. A disposable syringe comprising a hollow body portion provided at a first end with a closure adapted to incorporate a protruding hollow needle, and a piston member slidably located within said hollow body portion, the piston member being provided with an actuating rod member emerging from a second end of the hollow body portion, and wherein means is provided at said second end for selectively interengaging with said rod member to effect a clamping action thereon, the construction and arrangement being such that the piston member is permitted to partake of a single discharging stroke action in a direction towards said body portion first end and prevented from partaking of a return stroke so precluding a second discharging stroke action taking place in said first mentioned direction.

2. A syringe as claimed in claim 1 wherein the selectively interengaging means at said second end is arranged to permit charging of the syringe with liquid in a piston stroke action in a direction reverse to that of the first mentioned direction and preceding said single discharging stroke.

3. A syringe as claimed in claim 1 wherein the hollow body portion is adapted to receive a charged capsule or cartridge of liquid to be discharged in said single discharging stroke.

4. A syringe as claimed in claim 1 or 2, wherein the

selective interengaging means comprises a tongue or tongues secured to a portion of the hollow syringe body and engaging with a roughened or grained surface on the actuating rod member, said means being configured to permit relative movement in one direction only.

5. A syringe as claimed in any one of claims 2 to 4 wherein the selective engagement means comprises a tongue or tongues secured to a portion of the hollow syringe body and engaging selectively with one or other of two series of teeth-like formations on the actuating rod member in a single stroke in one direction in engagement with one of said series and a single stroke in a reverse direction, there being further provided means to permit rotary movement of the actuating rod member between said two single strokes.

6. A syringe as claimed in claim 5 wherein means are provided to prevent rotary movement in a direction reverse to said first mentioned rotary movement.

7. A syringe as claimed in any one of claims 4 to 6 wherein the teeth-like formations are located in an at least slightly recessed portion of the actuating rod member.

8. A syringe as claimed in claim 7 wherein said recessed portions are in side faces of the rod member which has a rectangular cross section.

9. A syringe as claimed in claim 7 wherein the rod member has a cruciform cross section.

10. A syringe as claimed in claim 1 wherein said actuation rod member is at least partially hollow so that a tampering action upon the rod to avoid the clamping action of said selective interengagement results in the formation of a leakage path from the hollow body portion of the syringe through the rod to waste.

11. A syringe as claimed in either one of claims 1 or 10 wherein the piston member is provided upon its rod side with an irregular surface so as to prevent replacement of the rod by a substitute rod having a smooth surface intended to obviate the action of the interengagement means.

12. A syringe as claimed in claim 1 wherein in order to cause a tampering action upon the selective interengaging means to result in the formation of a leakage path from the hollow body portion to waste, the hollow body portion is provided with a double wall construction comprising a first, inner, wall in the form of a cylindrical sleeve open at an end thereof adjacent said first end of the hollow body portion and within which sleeve is received said piston member in a liquid-tight fit, and an outer, concentrically arranged wall having a first diameter at said first end and a second, larger, diameter at said second end of the hollow body portion there being provided a clearance between the open end of the sleeve and the outer wall at its first diameter to effect a leakage path to waste in the event of rupture of the outer wall.

13. A syringe as claimed in claim 1 wherein said hollow body portion comprises a tubular member a first, open, end of which is in contact with said closure in a sealing engagement therewith, a second end of said tubular member being provided with a second closure adapted partially to close said second end so as to allow passage of the piston actuation member therethrough, and wherein the closures at said first and at said second ends are linked by wall means positioned externally of said tubular member, the construction and arrangement being such that access to the tongue means to release said clamping action is restricted by said wall means and second closure, removal of said closure or severance of the link provided by said wall means resulting in the release of the sealing engagement between the first end of the tubular member and the first closure.

14. A syringe as claimed in claim 13 wherein said wall means comprise at least two elongate members extending between the two closures so as to maintain the sealing engagement, gaps between the elongte wall members permitting inspection of the tubular members and its contents.

15. A syring as claimed in either one of claims 13 and 14, wherein the sealing engagement is achieved between confronting surfaces of one of said closures and of the open end of the tubular member, the material comprising one of said surfaces being of relatively soft material

with respect to the material of the other surface so as to enhance the sealing contact therebetween.

16.A syringe as claimed in any one of claims 12 and 15, wherein the interengaging means comprises a tongue or tongues adapted to engage teeth or like formations upon the actuating rod member.

17. A syringe as claimed in any one of claims 12 to 16, wherein the actuating rod member is hollow.

18. A syringe as claimed in any one of the preceding claims wherein there is provided so as to pass through said first closure a needle having both ends adapted to carry out a piercing action, a second, inwardly direction, end of the needle being provided with a piercing end adapted to render ineffective for future use sealing means normally enabling the syringe to be charged with liquid.

19. A syringe as claimed in claim 18 wherein the second needle end is arranged to pierce an end face of the piston member or of its supporting actuating rod member.

20. A syringe as claimed in claim 19, wherein said end face is provided with a recess in alignment with said second needle end prior to the charging of the syringe, rotary movement of the actuating rod member prior to discharging stroke of the member and its associated piston moving the recess out of alignment with said second needle end.

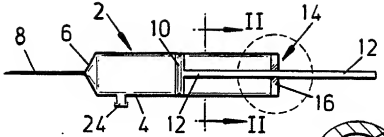


FIG. 1

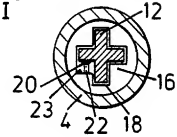


FIG. 2

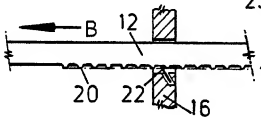


FIG. 3

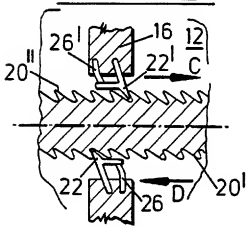


FIG. 4

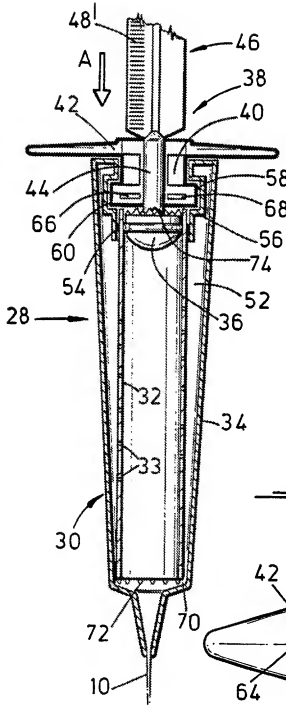


FIG. 5

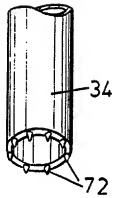


FIG. 7

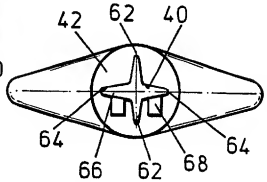


FIG. 6

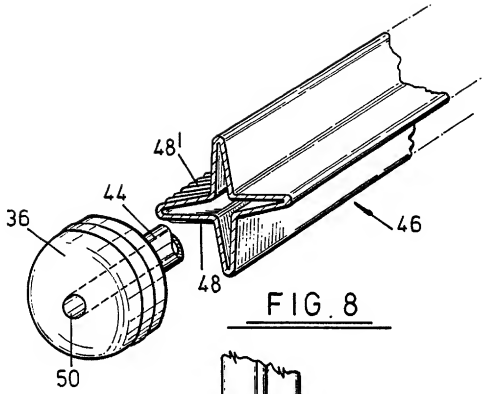


FIG. 8

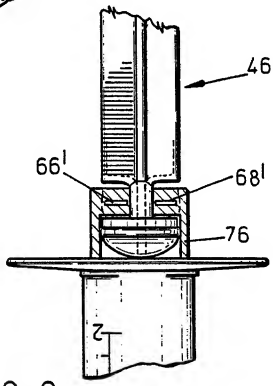


FIG. 9

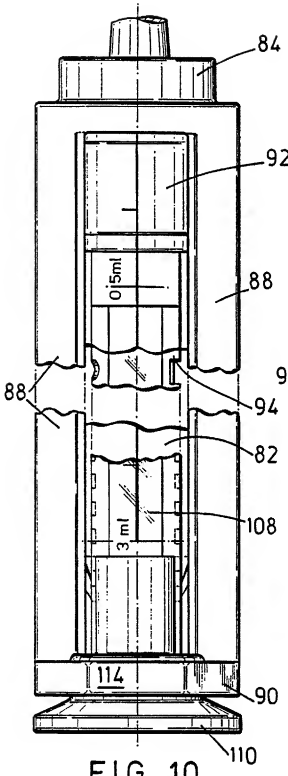

84
92
0 5ml
88
88
94
82
3 ml
108
114
90
110

FIG. 10

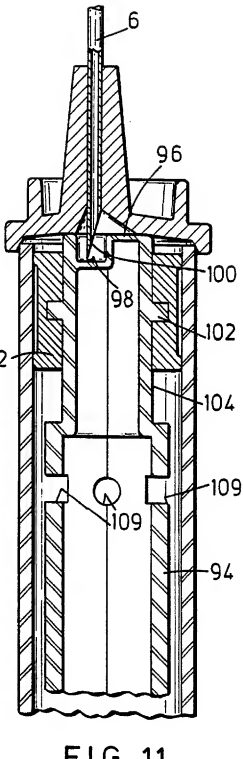
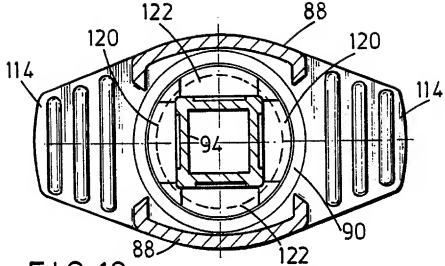

6
96
100
98
102
92
104
109
109
94

FIG. 11


122
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114
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94
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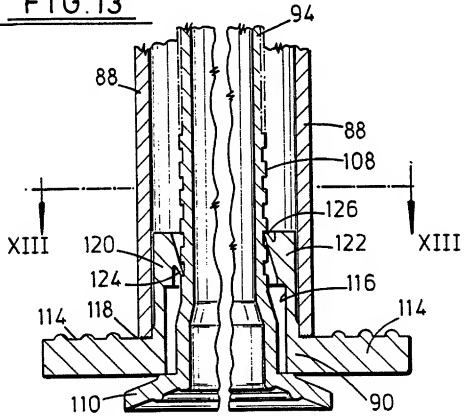
88
122

FIG.13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XIII
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FIG.12

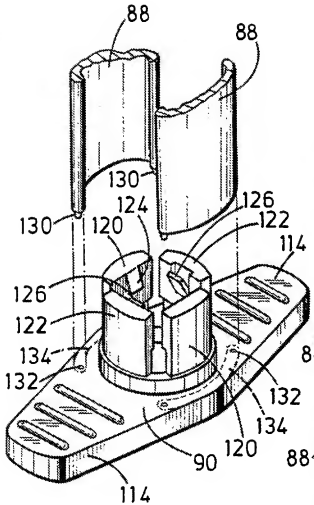
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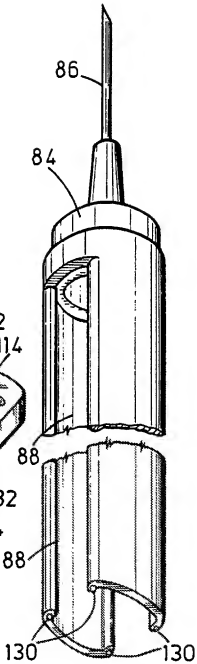
FIG. 14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130
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FIG. 15

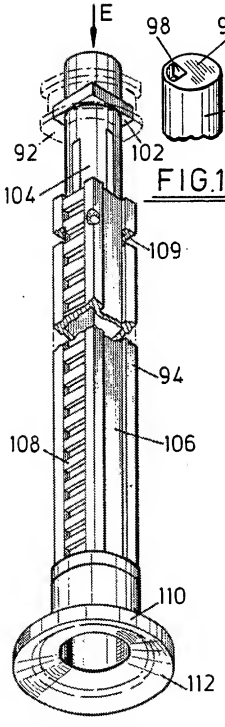

FIG.16

FIG.17

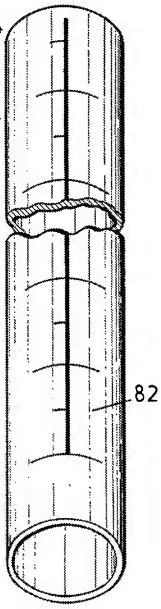

FIG.18

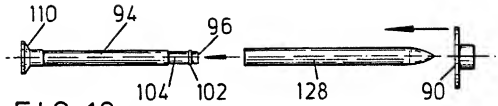

FIG.19

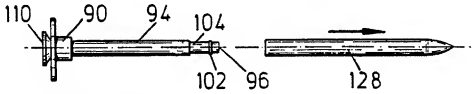

FIG.20

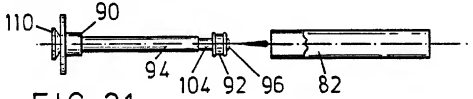

FIG.21

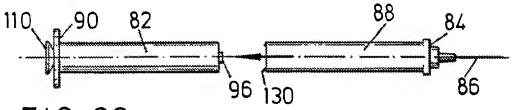

FIG.22

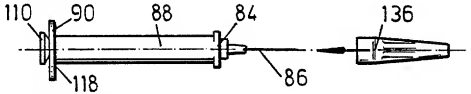

FIG.23

INTERNATIONAL SEARCH REPORT

International Application No PCT/GB 90/00496

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all)[5]

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC5: A 61 M 5/50

II. FIELDS SEARCHED

Minimum Documentation Searched[7]

Classification System	Classification Symbols
IPC5	A 61 M

Documentation Searched other than Minimum Documentation to the Extent that such Documents are included in Fields Searched[8]

III. DOCUMENTS CONSIDERED TO BE RELEVANT[9]

Category *	Citation of Document,[11] with indication, where appropriate, of the relevant passages[12]	Relevant to Claim No.[13]
X	GB, A, 2203047 (GILBERT HENRY BANKS) 12 October 1988, see the whole document	1,2,4-6
Y		18,19
A		16
	--	
X	US, A, 4731068 (HESSE) 15 March 1988, see column 6, line 53 - column 8, line 32; figures 20-28	1,2,4,7, 9
	--	
P,X	US, A, 4826483 (MOLNAR) 2 May 1989, see the whole document	1,2,4-9
	--	

* Special categories of cited documents:[10]

"A" document defining the general state of the art which is not considered to be of particular relevance

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"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance, the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance, the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
18th June 1990	16 JUL. 1990
International Searching Authority	**Signature of Authorized Officer**
EUROPEAN PATENT OFFICE	MISS T. TAZELAAR

Form PCT/ISA/210 (second sheet) (January 1985)

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)

Category *	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No
Y	US, A, 4687467 (CYGIELSKI) 18 August 1987, see abstract	18,19
	--	
A	EP, A1, 0300694 (DOWTY SEALS LIMITED) 25 January 1989, see column 10, line 47 - column 11, line 55; figures 12-14	10,17
	--	
A	US, A, 3438549 (RITZ) 15 April 1969, see abstract; figures 1,2	20
	--	

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON INTERNATIONAL PATENT APPLICATION NO. PCT/GB 90/00496

SA 35708

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on 24/05/90
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
GB-A- 2203047	12/10/88	US-A-	4840616	20/06/89
US-A- 4731068	15/03/88	NONE		
US-A- 4826483	02/05/89	NONE		
US-A- 4687467	18/08/87	DE-A-	3716409	17/12/87
		GB-A-	2191405	16/12/87
		JP-A-	62292168	18/12/87
EP-A1- 0300694	25/01/89	AU-D-	1916088	27/01/89
		GB-A-	2207054	25/01/89
		JP-A-	1049568	27/02/89
US-A- 3438549	15/04/69	NONE		